



Figure 7. Hawaii Island District Map Showing Schematic Routes of Umi's Trails (Based on Cordy 2000:210)

Other *heiau* on Hawai‘i were built under the direction of ‘Umi, including one at Pu‘u Ke‘eke‘e on the northwestern boundary of PTA. Maly and Maly (2002:12) provide the following translation of a reference to the *heiau* at Pu‘u Ke‘eke‘e as described in the Hawaiian language newspaper, *Ke Au Okoa*:

...and on the side of Mauna Kea, by where one travels to Hilo, he built the third of his temples, at the place called Puukekee [also written Puu Keekee in historical texts].

### 3.1.2 Bird Hunting

The Saddle Region was a known habitat for a number of bird species hunted by Hawaiians, particularly for the meat of the larger *nēnē* (*Nesochen sandvicensis*), and *ua‘u*<sup>2</sup> (*Pterodroma phaeopygia sandwicensis*). Although no direct references are found regarding *nēnē* hunting in the Saddle, late 19<sup>th</sup> century boundary testimonies indicate the birds were hunted in the adjacent Ka‘ū District (Cordy 1994:106). The *nēnē* were often captured in the uplands during their molting season for food and feathers, the latter of which was used in the making of *kahili* (Malo 1971:37).

The *ua‘u* or Hawaiian Petrel were seasonally hunted in the Saddle Region by both pre-Contact and early post-Contact Hawaiians. A mid-19<sup>th</sup> Century account stated that residents of Ka‘ohe Ahupua‘a (including the Saddle) had the “sole privilege of capturing the *ua‘u*, a mountain-inhabiting sea-fishing bird” (Lyons 1875:111; in Hommon and Ahlo 1983:21). At the turn of the 20<sup>th</sup> century, it was noted the *ua‘u* once “nested in great numbers in the lava between Mauna Kea and Mauna Loa” but that the nesting sites were no longer occupied after being invaded by the mongoose (Henshaw 1902:120). Hawaiians also captured *ua‘u* with nets as the birds flew to the mountains in the evening (Handy and Handy 1972:259).

Juvenile *ua‘u* were considered a delicacy for Hawaiian *ali‘i* and were extracted from their burrows with a long stick that was used to pierce the bird’s down:

It is said that years ago the nestlings of the uau were considered a great delicacy, and were tabooed for the exclusive use of the chiefs. Natives were dispatched each season to gather the young birds which they did by inserting into the burrows a long stick and twisting it into the down of the young which were then easily pulled to the surface (Henshaw 1902:102).

Hawaiians cooked birds by broiling their carcasses over hot stones or inside *ti* and *kalo* (Handy and Handy 1978:258). Food items, including birds, were also cooked from the inside out, as described by Buck (2003:18):

The boiling method used throughout Polynesia consisted of applying heat from the inside instead of from the outside. The food was placed in wooden bowls with water, into which red hot stones were dropped. Heated stones termed ‘eho were also placed in the interior of fowls.

The upland forests, likely including the Saddle Region, supported a wide variety of Songbirds, such as *apapane* (*Hiatone sanguinea*), ‘amakihi (*Hemignathus* spp.), and ‘i‘iwi (*Vestiaria coccinea*), whose feathers were used in chiefly feather capes and helmets (Malo 1971:76-77). According to Emerson (1894; in Welch 1993:26), the collection of bird feathers was done by a specialist known as a *kia manu*, who captured a bird using a pole with a sticky gum-like substance derived from the *papala* or *oha* plants.

Although some of the birds with fewer colorful feathers survived the plucking, the *i‘iwe* and *apapane* were inevitably cooked and eaten, having not survived the extensive plucking of their abundant red

<sup>2</sup> The ‘ua‘u is a nocturnal pelagic seabird that comes onto land from March to November. They can nest in a variety of environments and elevations and only require soil-covered slopes or irregular terrain for nest chambers. Chicks are hatched in late June and spend about four months in their burrows (Ziegler 1998; in Shapiro et. al 1998: Appendix C).

plumage (Buck 2003:217-218). *Pueo* or Hawaiian owls, although considered an *aumakua* by many Hawaiians, were also captured for their plumage, commonly used in the making of feather *kahili* (Malo 1971:38).

### 3.2 POST-CONTACT HISTORY

Early historic accounts provide some insight into the remoteness of the Saddle Region and the difficulties exploring parties encountered when attempting to cross the Saddle. Hommon and Ahlo (1983:27) summarize these accounts:

Menzies (1920:16-67) referred in 1792 to a path from the PTA region to the Kona coast that appears to approximate the Judd Trail route. . . . Ellis stated that the “vast central valley” between Mauna Kea, Mauna Loa and Hualalai is almost unknown, no road leads across it. . . (1826:20). Dr. G.P. Judd was evidently unable to find a path when he crossed between Mauna Loa and Mauna Kea (McEldowney Ms.b.). Bingham, crossing from Kilauea crater to Waimea, noted that the lava fields were “so horrid as to forbid a path (Bingham 1855:394). During a later leg of his journey, between Mauna Kea and Hualalai, his party evidently was unable to find a trail and they wandered in a doubtful course, none of the natives with us able to set us right” (ibid.:396). Traveling from the Kona area, member of the U.S. Exploring Expedition found a “want of roads” and had to send their horses back to Kealakekua Bay because they could not negotiate the rough lava (Wilkes 1845:100, 102). The members of a party hiking around Mauna Kea in 1847 found that “in many places [they] had great difficulty in finding any road at all” (Anonymous 1847:105).

#### 3.2.1 Transportation Routes

It is clear from ethno-historic and historic accounts that exploitation of and movement through the Saddle Region was accomplished with the aid of a system of trails. Using oral histories and archival sources, Langlas *et al.* (1998:24–27) identified five trails within the current boundaries of PTA (see Routes 1-5 on Figure 8).

##### Waimea to Hilo

Perhaps the most frequently used post-Contact route extended between Waimea and Hilo (see Route 1; Figure 8) along a course similar to the current Saddle Road. During the mid 19<sup>th</sup> century, the Hawaiian Kingdom ordered the construction of the Alanui Aupuni (Government Road) between Kona and Hilo, specifically to facilitate horse and horse-drawn cart travel between the population centers and important resource areas, such as out lying ranch lands on the Saddle (Maly and Maly 2002:116-117). Surveyor notes compiled in 1869 describe the intended route of the cart road from Waimea to Hilo as “already a good natural road from Waimea to a point known as Kalaeha [Kala’i’ehu] on the S.E. side of Mauna Kea” (Maly and Maly 2002:119-120). A section of this historic route between Waiki‘i and Kilohana (in upper Waikōloa Ahupua‘a) is said to follow a pre-existing Hawaiian foot trail (Maly and Maly 2002:117).

##### Kona to Pu‘u Ke‘eke‘e

A trail between Kona and Pu‘u Ke‘eke‘e (Route 2; see Figure 8) is said to have paralleled the southeast boundary of Kaohe Ahupua‘a near an existing jeep road referred to as Bobcat Trail (Langlas *et al.* 1998:26). Sections of the trail have been identified as Sites 5008, T-110, and 5009, and intermittent sections of the trail are indicated on early 20<sup>th</sup> century topographic maps (Langlas *et al.* 1998:24). This post-Contact travel route may approximate the former pre-Contact trail reportedly established on the Saddle by the Hawaiian Chief ‘Umi a Liloa for travel between Waimea and the Kona coast.

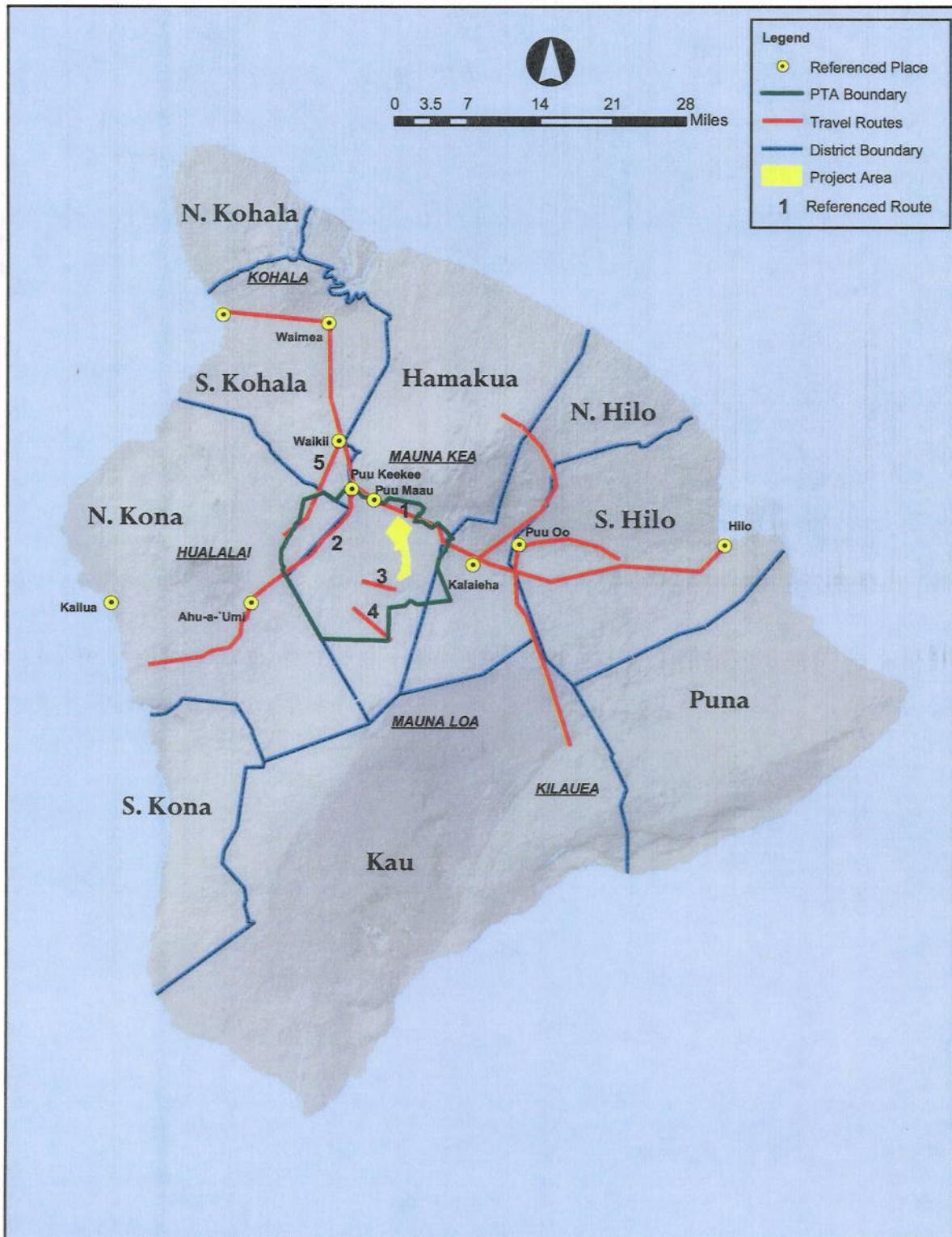


Figure 8. Hawaii Island District Map Showing Schematic Routes of Travel Routes and Placenames

### **Waiki‘i to Ahu-a-Umi**

Local informants once associated with cattle ranching in the uplands of Kohala and North Kona districts recount of an early 20<sup>th</sup> century trail that spanned between the historic cattle station of Waiki‘i (located in upper South Kohala) to Ahu a ‘Umi at the back of Hualālai (Route 5, see Figure 8). The trail was referred to as a “sleeping place trail,” and reported by others as having shelters along its length (Langlas *et al.* 1998: F-1). Intermittent sections of this trail also appear to be on early USGS Quadrangle maps (Puu Anahulu 1923 and Keamuku 1927 7.5 minute series). This trail eventually intersected the Kona to Pu‘u Ke‘eke‘e trail before reaching Ahu a ‘Umi Heiau.

### **Mid-PTA**

Langlas (1998:27) described a possible pre-Contact trail section at the center of PTA that runs parallel, but south of the Waimea to Hilo travel route (Route 3, see Figure 8). This trail is indicated on a 1930s USGS Kaohe Quadrangle and may be marked by a series of rock markers or *ahu* (Langlas 1998:27).

### **Kona to Volcano**

Langlas (1998: 27) also described a possible pre-Contact trail that ran from the “Kona side of Kaohe” Ahupua‘a southeast towards Kilauea Volcano (Route 4, see Figure 8). Similar to the mid-PTA trail, the southern trail is shown as trail segments on the 1930s USGS Humuulu Quadrangle (Langlas 1998:27).

### **3.2.2 Sandalwood**

Between approximately 1815 and 1826, sandalwood or ‘iliahi (*Santalum* spp.) was actively harvested in the upland forest lands of the Hawaiian Islands for export to China (Cuddihy and Stone 1990:38). Thousands of trees were taken from the upland slopes of Kohala and Mauna Kea and transported by foot to Kawaihae for shipping to Honolulu and beyond. A Native testimony describing the boundary of Waikōloa bordering Kaohe Ahupua‘a on the west speaks of cutting sandalwood in the region:

*Kiai, sworn:.... I am well acquainted with that part of the boundary and the rest of it also. I have travelled the whole line personally. Used to hunt for uwau and neenee [nēnē], and to cut sandal wood in that part of the country...(Records from Proceedings of Boundary Commission; in Maly and Maly 2002:87)*

The 1845 U.S. Exploring Expedition made reference to caves along the Waimea to Kona Trail and near ‘Umi’s Heiau that were supposedly used by sandalwood collectors (McEldowney 1979). Bundles of sandalwood have been found in a lava tube in the western portion of Kaohe (Site 19491). However, the small size of the sandalwood cache suggests the wood was not intended for export (Shapiro and Cleghorn 1998:48).

### **3.2.3 Cattle/Sheep Industry**

Cattle first arrived in Hawaii in 1793 as a gift from George Vancouver to Kamehameha I. These animals were protected under *kapu* for ten years to ensure their multiplication. Vancouver requested Kamehameha place a 10-year *kapu* on the killing of cattle to ensure the herds multiplied. The herds reproduced rapidly in the Waimea region and mountain slopes and by 1802 the animals had become so wild “that none of the natives dare approach them” (Turnbull 1813:243, in Kelly 1974:44). Crops were being destroyed by cattle despite the construction of fencing

By 1818, Kamehameha sought to control the sizable herds of roaming cattle by hiring foreign “bullock hunters” to hunt the feral beasts. One of the first bullock hunters was John P. Parker, the founder of Parker Ranch (Kelly 1974:44). By 1837, bullock hunting had become an industry in itself, with over 60 operators reported and the use of bullock pits being the common method for catching cattle (Bergin

2004:28). The Reverend William Ellis described early bullock hunting observed by his companion Mr. Goodrich upon descending Mauna Kea:

...he saw at a distance several herds of wild cattle, which are very numerous in the mountains and inland parts of the island...They first carry all the salt to the mountains. When they have killed the animals, the flesh is cut off the bones, salted immediately, and afterwards brought on the men's/ shoulders ten or fifteen miles to the sea-shore (Ellis 1984:402).

Ranching sites within the Saddle are primarily related to operations at Humu'ula Sheep Station, which by 1862 consisted of three separate stations in Humu'ulu Ahupua'a, including a station at Kala'i'ehu just northeast of PTA (see Figure 8). Kala'i'ehu may represent the "first permanently occupied dwelling in the vicinity of PTA" (Shapiro *et al.* 1998:14).

Kala'i'ehu is described by Charles De Varigny's in 1857:

Kalaieha is neither a town, nor a village, nor even a huddled corral of grass huts. It is an immense plain which sprawls between two mountains. At certain periods of the year, especially in July and August the plain abounds in wild geese attracted by the ohelo, small red berries with a rather insipid flavor. The shrub bearing this fruit is more plentiful in Kalaieha than anywhere else. More over, during the period of our excursion, sportsmen and amateur hunters looking for game pay frequent visits to Kalaieha for the pleasure of shooting.

Unfortunately, wild geese begin to spoil very quickly and cannot stand being shipped to Honolulu... The plain was entirely deserted and the bushes were stripped of their fruits. In compensation, though the geese were missing, the wild bullocks, boars, and stray dogs who had reverted to a state of nature were present in hoards. The place swarmed with wild boars (De Varigny in Korn 1981:90-91).

By 1873, a wagon road was in use between the Kala'i'ehu sheep station and Waimea. The Humu'ula Sheep Station operation was eventually bought by James Gay in 1876 and mortgaged to Hackfields in 1885 (Langlas *et al.* 1998:44). Ranch walls, many of which can still be seen from Saddle Road, were laid out by A. Haneburg, the station manager, and built by Japanese immigrants in 1895. The south wall (south of Saddle Road) was built to keep sheep from wandering into the rugged Mauna Loa lava flows (Langlas *et al.* 1998:51).

Samuel Parker bought a controlling interest in Humu'ula Sheep Station Company in 1900, by which time operations in the Saddle had grown to 237,000 acres for pasturing up to 30,000 sheep (Langlas *et al.* 1998:50, Hommon and Ahlo 1983:29). Parker also began to pasture cattle in the northeastern portion of Humu'ulu with greater water sources. In the 1930s, informants recalled cowboys driving sheep across the Saddle from Humu'ulu to Kawaihae for shipping to Honolulu (Langlas *et al.* 1998:53). The locations of Pu'u Ke'eke'e and Pu'u Mau'u described below are shown on Figure 8):

We used to bring the sheep down in the afternoon from Humu'ulu, down to a corral they call Pu'u Mau [Mau'u]. And that hill is on the Humu'ulu side of Pu'u Ke'eke'e on the right hand side of the Saddle Road as you come up Pu'u Mau, we used to put sheep in there and then ride back to Humu'ulu, spend the night at Humu'ulu and leave Humu'ulu about 2:00 in the morning, ride down to Pu'u Mau, pick up the sheep and bring 'em down to Nohonaohae and leave 'em at Nohonaohae...

Ranching continued in the Saddle through the 20<sup>th</sup> century. There were about 7,000 sheep and 3,000 cattle in Humu'ula in 1950. Operations ceased in 1970 (Langlas *et al.* 1998:51).

### 3.2.4 U.S. Military

During the World war II era (*ca.* 1943-1945) the U.S. military maintained a military camp (Camp Pohakuloa) in the vicinity of the current cantonment and conducted training activities at an adjacent anti-tank range, artillery range and impact area (Langlas *et al.* 1998:55). The U.S. Government constructed Saddle Road in 1943 to allow troops to move into the interior in case of a subsequent attack (Langlas *et*

al. 1998:55). PTA was established as a training facility in 1956, which at that time included over 116,000 acres of land under lease and ownership by the U.S. Government.

### 3.3 PREVIOUS ARCHAEOLOGY

#### 3.3.1 Greater PTA Region

Greater than 40 archaeological investigations have been conducted at PTA to date, resulting in the approximate coverage 16,007 hectares. The reader is referred to Roberts et al (2004a), among others, for a more detailed summary of the previous studies.

The previously documented site types include traditional Hawaiian sites associated with ceremony, transportation, possible bird catchment, quarrying and lithic workshops. Post-Contact ranching walls and infrastructure are also present in proximity to Saddle Road and the former cattle/sheep station (Kala'i'ehu) just east of PTA. Military structures attributable mainly to recent training activities have been observed throughout PTA. These site categories are summarized below.

##### Occupation

Occupation sites in the Saddle are typically classified as either limited-use or repeated-use sites. Limited-use sites were occupied on a short-term basis, such as an overnight stay (Streck 1992:102). The limited-use occupations are defined by sparse amounts of cultural material, often limited to charcoal scatters or shallow ash deposits, limited artifact scatters, or sparse midden. Limited-use occupation sites are generally located near trails running through the Saddle Region (Athens and Kaschko 1989; Cordy 1994:206; Hommon and Ahlo 1983).

Repeated-use sites contain midden deposits, features, and exhibit structural modifications such as platforms, walls, terraced areas, and cupboards. Cultural deposits at repeated-use sites are stratified and typically contain a wide range of well-preserved artifacts (Athens and Kaschko 1989; Haun 1986; Shapiro et al. 1998; Shapiro and Cleghorn 1998; Streck 1986). Faunal assemblages at repeated-use sites are dominated by bird bone, particularly those of adult 'ua 'u (Hawaiian petral), though marine shell and fish bone also occur in limited quantities (Athens and Kaschko 1989; Ziegler in Shapiro et al. 1998). Some repeated-use sites may represent base camps for groups exploiting resources in the area (Reinman and Schilz 1992:116–118).

Of the 188 radiocarbon dates obtained from occupation sites at PTA, the majority fall within the period AD 1400 to 1700, with one of the earliest dates (AD 780 to 1020) obtained from a lava tube site (Site 18672) south of the project area (Shapiro et al. 1998: 30).

##### Bird Hunting

It has been suggested by Moniz-Nakamura et al. (1998) and Hu et al. (2001) that excavated *pāhoehoe* pits documented as cultural features at PTA and Volcano National Park, respectively, represent efforts to create nesting habitat for 'ua 'u or to enlarge natural burrows to retrieve nestlings. All the pits previously recorded at PTA were identified in blisters in a weathered Mauna Loa flow (klo) formed between 5,000 to 10,000 years ago (Moniz-Nakamura 1998:113).

Both Moniz-Nakamura et al. and Hu et al. considered the possibility that the pits may have been used for sweet potato planting areas, but they consider it unlikely. As Hu et al. note:

... using the pits for growing crops ... is unlikely. Hawaiian varieties of sweet potato, the most likely crop, cannot tolerate the combination of cold aridity and lack of soil evident at this altitude on Mauna Loa (Hu et al. 2001:9).

Moniz-Nakamura (1998:116) concludes that the pits served dual functions: to make bird nesting sites more accessible to hunters and to expand the birds' habitat to promote larger populations. Williams (2002:111) speculates the *ua'u* were intensively hunted (and bird nests enhanced) during a 200-year period (AD 1400 to 1600) to provide food to workers at the Mauna Kea Adze Quarry Complex.

### Transportation

Trails have been located in PTA in the form of isolated segments of worn lava paths, linear curbstone constructions and alignments of cairns. Some of the sections near the western boundary of Kaohe are identified as the Nā'ōhule'elua Trail (SHPD Sites 5006, 5007 and 5008), possibly representing a section of 'Umi's Kona to Waimea trail route once passing on the back side of Huālalai (Site 19258) or the Kona to Pu'u Ke'eke'e or Hualālai to Waiki'i trails documented by Langlas *et al.* 1999:25). Other trail sections have been documented near the southeast boundary of PTA around Pu'u Koli (Shapiro *et al.* 1998:18)

### Quarries and Lithic Workshops

A complex of volcanic glass quarries (previously referred to as "chill glass") totaling approximately 16.8 hectares (41.5 acres) has been documented at PTA. The quarries occur in the k4 flow in the eastern portion of PTA (Williams 2002; Roberts 2004a and 2000b) and in the k3 flow in the western portion of PTA (Reinman and Schilz 1992). The occurrence of volcanic glass on surfaces of the k4 flow is directly tied to the geology and flows of Mauna Loa:

The [quarries are] within an outcrop of pahoehoe lava designated k4 by the U.S. Geological Survey. This flow has been dated to ~330 yrs. B.P. The k4 flow field is a complex of individual flow lobes that range in character from brown-weathering areas with only very thin glass crusts, to blue-black-weathering units that are characterized by conspicuous glass surface crusts ranging up to ~3cm in thickness. It is within the latter units that specific areas were exploited as glass quarries. The black-weathering units are very dense pahoehoe, typical of that which has degassed during transit in lava tubes and subsequently oozed out down slope....The quarried lava is a basalt with scattered micro-phenocrysts of olivine ranging up to ~1mm in size.

The outcrop of dense pahoehoe containing the quarries is dominated by the relatively thin pahoehoe flow lobes up to ~30 cm thick. Some of the flatter lobes have conspicuousropy surfaces. These ropes were heavily worked to produce elongate glassy blade-like flakes up to ~10cm long. Pahoehoe toes without ropes also were quarried, to produce 5-15cm chunks with 1-3cm thick glassy rinds...There is, however, no evidence for preferential quarrying of the tumulus. Apparently flow surfaces within the outcrop area of dense black pahoehoe were equally worked, irrespective of local flow morphology (Stinton 2004).

Williams (2002:71) noted the use of "large hammerstones made of vesicular pahoehoe" for initial quarrying of the volcanic glass and small, dense basalt hammerstones, derived from Mauna Kea basalt, for secondary reduction activities. GANDA later identified hammerstones at 19% of the recorded quarries at Site 23856 (Roberts *et al.* 2004a:19). The majority identified were small, dense, water-worn basalt hammerstones.

Lithic scatters denoting workshops are found in various contexts at PTA, including occupation sites, cairn complexes, quarries and as isolated scatters. The scatters may represent reduction of adze blanks, retooling, or production of flake tools. Raw material is generally fine-grained basalt and most of the material, with the exception (for example) of Site 5003 (Welch 1993), appears to be from local PTA sources (Shapiro and Cleghorn 1998:71). Interestingly, basalt flakes analyzed at a local quarry site at PTA was contained a different chemical composition than the quarried rock; thus, suggesting Hawaiians were carrying basalt into the Saddle Region, and possibly reworking it there (Shapiro and Cleghorn 1998:36).

Reinman and Schilz (1992:237, 254) also propose scoriaceous basalt for abraders was being extracted from excavated pits at PTA. This theory contradicts others interpretation that the pits were excavated as a means to capture birds (cf. Moniz-Nakamura *et al.* 1998; Hu *et al.* 2001) (see Bird Hunting discussion above).

### Ceremonial Sites

Sites containing possible evidence of ritual use are occasionally found at PTA, commonly identified by the presence of vertical or “upright” stones placed near platforms or lava tubes (Shapiro *et al.* 1998; Williams 2002; Williams *et al.* 2002). Other ceremonial sites are carefully designed and constructed *ahu* or cairn complexes (Williams 2002). Only one *heiau*, built under the direction of 15<sup>th</sup> century Hawai‘i Island chief ‘Umi Liloa, was documented in the Saddle Region west of PTA (Ahu a ‘Umi). ‘Umi also reportedly built a *heiau* at Pu‘u Ke‘eke‘e in the northwest corner of PTA. Recent survey of the *pu‘u* and its surrounding areas, however, produced no evidence of a *heiau* (Desilets and Roberts 2005:40). Shapiro *et al.* (1998:7) speculate the paucity of *heiau* in the Saddle “is attributed to the regional influence of the Ahu a ‘Umi.”

### Historic Ranching Sites

As noted above, ranching sites within PTA are related to operations at the Humu‘ula Sheep Station, particularly at the Kala‘i’ehu sheep station just east of PTA. Several rock walls associated with the operation of Humu‘ula Sheep Station have been documented inside PTA generally in the vicinity of Saddle Road (Desilets *et al.* 2005; Roberts *et al.* 2004c, Welch 1993).

### U.S. Military Training Structures

A common problem for archaeologists working in former and current U.S. military training areas, particularly at PTA, is differentiating between traditional-Hawaiian temporary habitations and modern military training structures. Both functional types are constructed of local rock materials, are generally small in size, and have been expediently built for short-term use. They exhibit similar architectural forms, such as C-shapes, U-shapes, circular enclosures, wall sections, and cairns.

Several variables have been identified that distinguish military structures from the short-term use Hawaiian structures (e.g., Clark 1983; Clark 1987; Robins *et al.* 2000). These studies suggest that military training structures tend to lay directly on the ground surface, contain an excavated floor, are part of a larger complex of military structures and often contain training debris on the surface (e.g., MRE, military equipment, ordnance and scrap metal). Additional military characteristics observed at PTA include the incorporation of natural tree falls and branches into the structures.

In contrast, a traditional Hawaiian short-term habitation structure is commonly embedded in soil, is isolated or part of a small concentration of structures, and, in eroded landscapes, might contain traditional cultural material on the surface.

It is important to note the possibility of reuse or modification of traditional Hawaiian structures for military training activities. In these cases, a combination of traditional Hawaiian and military characteristics may be present.

#### 3.3.2 Previous Archaeology in Project Area

Five archaeological surveys were conducted within the current project area by Ogden Environmental and Energy Services (Ogden) (Williams 2002), BioSystems (Shapiro *et al.* 1998; Shapiro and Cleghorn 1998) and GANDA (Roberts *et al.* 2004a and 2000b) (Figure 9). All sites previously recorded in the project area are described and illustrated in Results (Section 6.0) of this report.

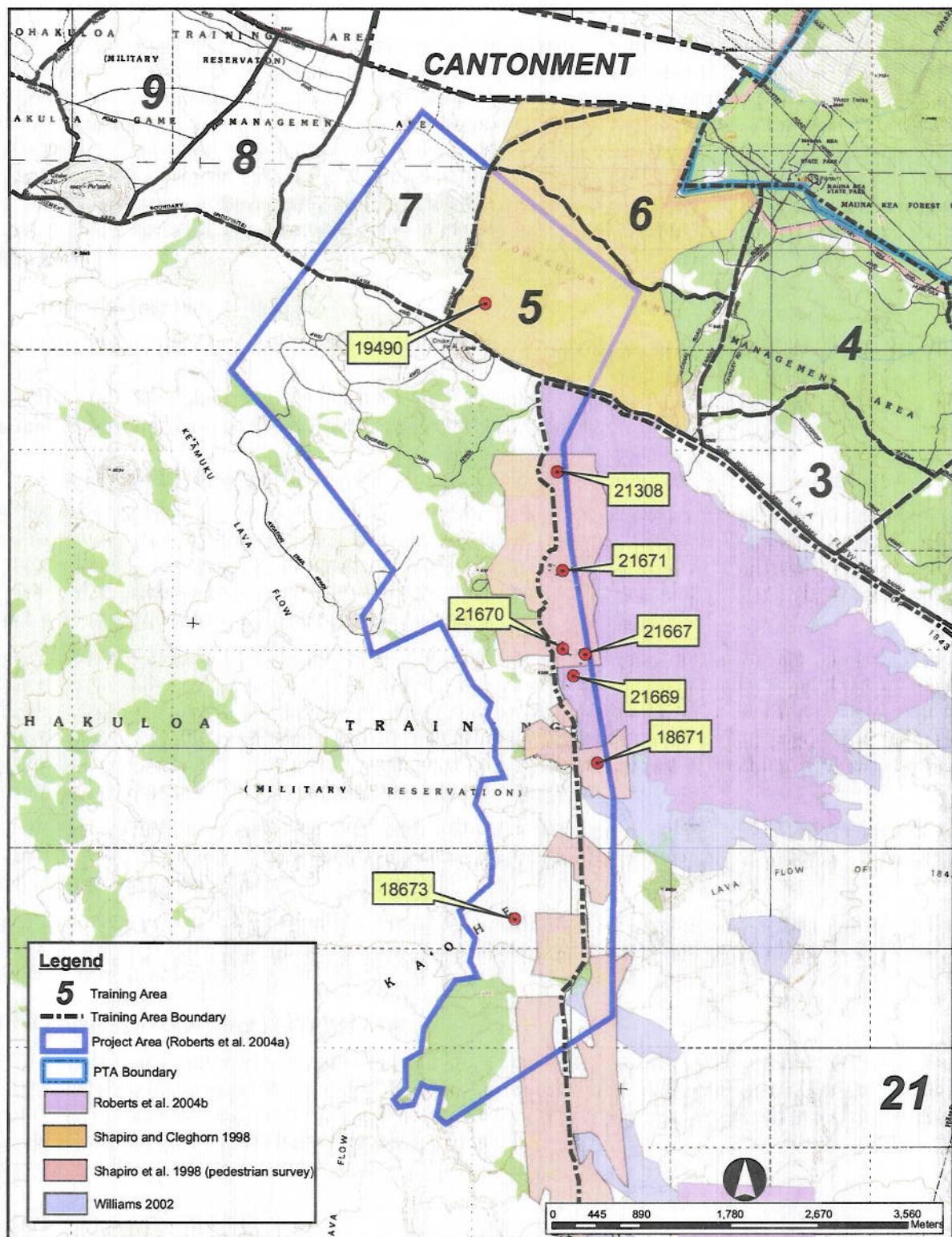


Figure 9. Previous Archaeological Studies in Project Area